ENERGIC Plus

PROGRAMMABLE BATTERY CHARGER

AR-TOP

USER'S MANUAL

V. 1.4.0 January 2011

1. SAFETY INSTRUCTIONS AND WARNINGS

GENERAL

Battery chargers can cause injury or death, or damage to other equipment or property, if the user does not strictly observe all safety rules and take precautionary actions.
Safe practices must be learned through study and training before using this equipment.
Only qualified personnel should install, use, or service this battery charger.

SHOCK PREVENTION

Bare conductors, or terminals in the output circuit, or ungrounded, electrically-live equipments can fatally shock a person. To protect against shock, have competent electrician verify that the equipment is adequately grounded and learn what terminals and parts are electrically HOT.

The body's electrical resistance is decreased when wet, permitting dangerous current to flow through the body. Do not work in damp area without being extremely careful. Stand on dry rubber mat or dry wood and use insulating gloves when dampness or sweat cannot be avoided. Keep clothing dry.

INSTALLATION AND GROUNDING – Electrical equipment must be installed and mantained in accordance with all the applicable national and local codes.
A power disconnect switch must be located at the equipment. Check the data label for voltage and phase requirements. If only 3-phase power is available, connect single-phase equipment to ONLY TWO WIRES of the 3-phase line.
DO NOT CONNECT the equipment grounding conductor to the third live wire of the 3-phase line as this makes the equipment frame electrically HOT, which can cause a fatal shock.
If a grounding conductor is part of the power supply cable, be sure to connect it to a properly grounded switch box or building ground. If not part of the supply cable, use a separate grounding conductor. Don't remove a ground prong from any plug. Use correct mating receptacles. Check ground for electrical continuity before using equipment.
The grounding conductor must be of a size equal to or larger than the size recommended by Code or this manual.

CHARGING LEADS – Inspect leads often for damage to the insulation. Replace or repair cracked or worn leads immediately. Use leads having sufficient capacity to carry the operating current without overheating.

BATTERY TERMINALS – Do not touch battery terminals while equipment is operating.

SERVICE AND MAINTENANCE – Shut OFF all power at the disconnect switch or line breaker BEFORE inspecting, adjusting, or servicing the equipment. Lock switch OPEN (or remove line fuses) so that the power cannot be turned ON accidentally.
Disconnect power to equipment if it is to be left unattended or out of service.
Disconnect battery from charger.
Measure voltage on capacitors and, if there is any voltage reading, wait 5 minutes before to proceed.
Keep inside parts clean and dry. Dirt and/or moisture can cause insulation failure. This failure can result in high voltage at the charger output.

BURN AND BODILY INJURY PREVENTION

The battery produces very high currents when short circuited, and will burn the skin severely if in contact with any metal conductor that is carrying this current.
Do not permit rings on fingers to come in contact with battery terminals or the cell connectors on top of the battery.
Battery acid is very corrosive. Alwais wear correct eye and body protection when near batteries.

FIRE AND EXPLOSION PREVENTION

When batteries are being recharged, they generate hydrogen gas that is explosive in certain concentrations in air (the flammability or explosive limits are 4.1% to 72% hydrogen in air). The spark-retarding vents help slow the rate of release of hydrogen, but the escaping hydrogen may form an explosive atmosphere around the battery if ventilation is poor.

The ventilation system should be designed to provide an adequate amount of fresh air for the number of batteries being charged. This is essential to prevent an explosion.
Always keep sparks, flames, burning cigarettes, and other sources of ignition away from the battery recharging area. Do not break "live" circuits at the terminals of batteries. Do not lay tools or anything that is metallic on top of any battery.

To prevent arcing and burning of the connector contacts, be sure the charger is OFF before connecting or disconnecting the battery. The digital display must be completely OFF.

MEDICAL AND FIRST AID TREATMENT

First aid facilities and a qualified first aid person should be available for each shift for immediate treatment of electrical shock victims.
EMERGENCY FIRST AID: Call phisician and ambulance immediately and use First Aid techniques recommended by the American Red Cross.

DANGER: ELECTRICAL SHOCK CAN BE FATAL.
If person is unconscious and electric shock is suspected, do not touch person if he or she is in contact with charging equipment, battery, charging leads, or other live electrical parts. Disconnect power at wall switch and then use First Aid.
Dry wood, wooden broom, and other insulating material can be used to move cables, if necessary, away from person.
IF BREATHING IS DIFFICULT, give oxygen.
IF NOT BREATHING, BEGIN ARTIFICIAL BREATHING, such as mouth-to-mouth.
IF PULSE IS ABSENT, BEGIN ARTIFICIAL CIRCULATION, such as external heart massage.

In case of acid in the eyes, flush very well with clean water and obtain professional medical attention immediately.

EQUIPMENT WARNING LABELS

Inspect all precautionary labels on the equipment.
Order and replace all labels that cannot be easily read.

2. DESCRIPTION

The AR-TOP Charger is suitable to charge **lead-acid** motive **batteries**.
The operation is completely automatic, and it's managed by a microprocessor control system, composed by a Main Control Board, installed inside of the charger, and an optional wireless Battery Identification Module (WBM), that is permanently connected to the battery.

The AR-TOP has two, **selectable charging curves** (**Wa** and **WSa**).

Wa: typical charge time 10-12 hours
typical start rate 15-18% of the battery capacity C/5

WSa: typical charge time 7-8 hours
typical start rate 23-26% of the battery capacity C/5

The power conversion system of the AR-TOP and its optimized charging algorithm help to reduce the charging factor to the minimum value, so the duration of the overcharge/gassing phase and the average temperature of the battery are minimized.

The AR-TOP Charger is equipped with a built-in **Real-Time Clock**, which allows the user to program the desired start time of the day, the full charge time window and to schedule the weekly equalize cycles.

It is possible to connect the charger to the Fleet Management System **DoctorFleet.com**, which allows to monitor, program and configure the complete fleet through a WEB based interface, at any time of the day and from anywhere in the World, to send automatic messages by email in case of problems.

The AR-TOP charger features an extensive set of advanced functionalities, including an automatic algorithm for the compensation of the voltage drop of the charging leads. These functionalities are programmable through an **Advanced Configuration Menu**. Please call your service technician for more details.

3. INSTALLATION OF CHARGER

Conditions of use:

- Operating/Storage temperature: 5°C to 45°C
- Relative humidity: less than 75%

WARNING !

The charger can be installed by qualified personnel only!
To avoid the risk of injuries, the user is not allowed to open the cabinet.
Always refer to qualified electricians for installation and service operations.

WARNING !

To prevent fire or shock hazard, do not expose the charger to rain or moisture.
Do not use the e charger in presence of flammable gas, because it can generate sparks!
Do not install the charger near flammable materials.

WARNING !

To reduce the risk of fire, the charger must be installed on a floor of non-combustible material.
If this is not possible, a floor plate of at least 1,6mm steel extended at least 150mm beyond the charger on all sides must be installed.

EQUIPMENT WARNING LABELS

Inspect all precautionary labels on the equipment.
Order and replace all labels that cannot be easily read.

***Energic plus* AR-TOP battery chargers have been designed to charge lead-acid batteries.**
These units can convert the AC input voltage to a DC voltage at the correct level, in order to charge the battery cells.
The digital electronic control is used to monitor the state of the charge, to automatically turn off the charger when the charge is complete and to visualize all the necessary information.
All the features of the digital control will be explained in the next chapters.

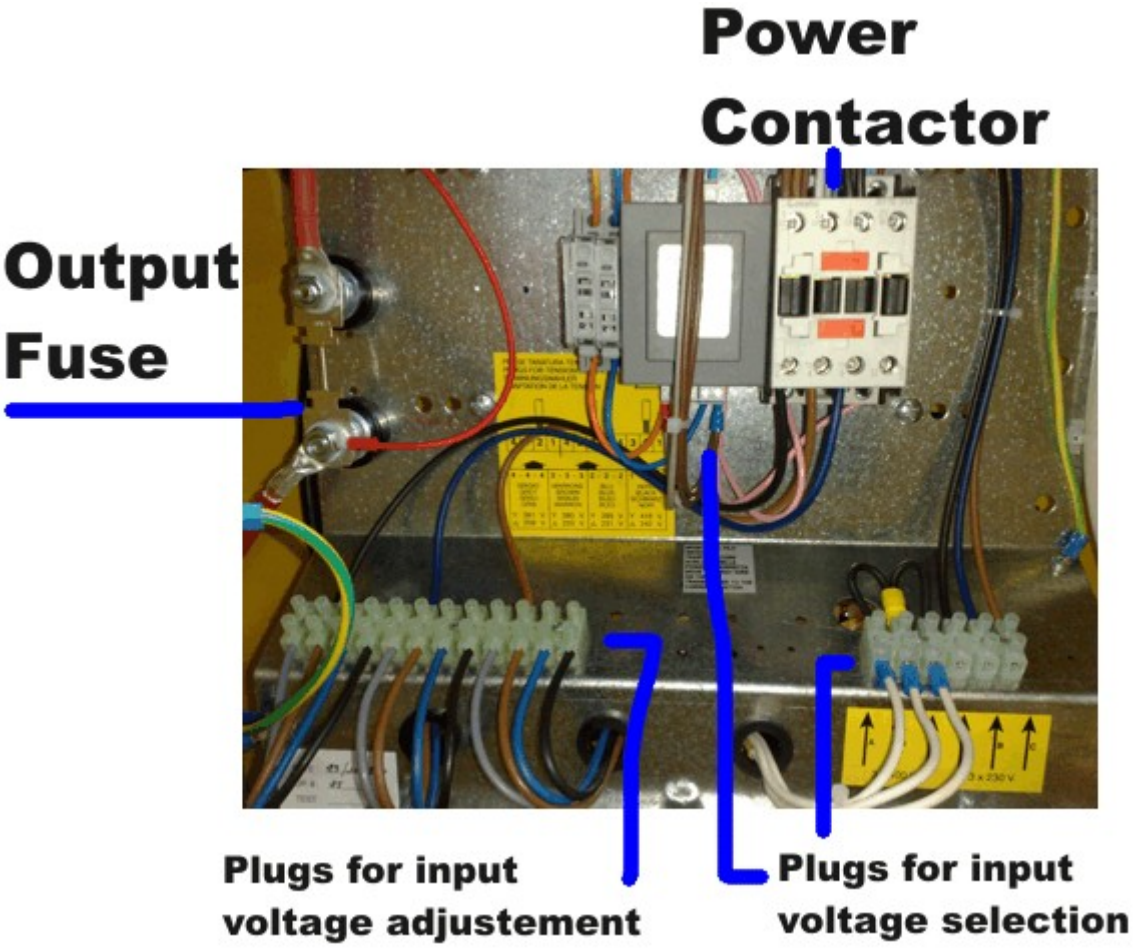
These are the principal devices included in the charger, available to the user:

- **External box;**
- **Control panel with digital display;**
- **STOP pushbutton (0-1);**
- **No.2 Cables for battery connection;**
- **No.1 Cable for main supply connection;**

External box
Control panel with digital display
Stop pushbutton (0-1)
N° 2 Cable for battery connection
N° 1 Cable for main supply connection

Inside of the charger, there are the following devices, not available to the user:

- **Power contactor;**
- **Power transformer;**
- **Microprocessor controlled electronic board;**
- **Output fuse;**
- **Plugs for input voltage selection;**
- **Plugs for input voltage adjustment.**



NOTE

The PLUG/BOARD FOR INPUT VOLTAGE SELECTION is present only in chargers with 3x 220 / 380 Vac input, and it's NOT present in chargers with 3x440 Vac input.

The PLUGS FOR INPUT VOLTAGE ADJUSTMENT are present in all the chargers.

The charger is marked with a technical label, containing the following data:

- **Model;**
- **Serial number (S/N);**
- **Weight (kg and lbs);**
- **Input voltages (V);**
- **Maximum input current (A);**
- **Maximum input power (KVA);**
- **Input frequency (Hz);**
- **Battery voltage (V);**
- **Maximum output current (A).**

CAUTION !

Allow adequate air circulation to prevent internal heat buildup.
Do not place the unit near materials that may block the ventilation slots.
Do not install the unit near heat sources such as radiators or air ducts, or in a place subject to direct sunlight, excessive dust, mechanical vibration or shock.

CAUTION !

The operations and settings described in this chapter are fundamental for the good functionality of the charger.
Improper settings can cause severe damage to the charger and the battery!

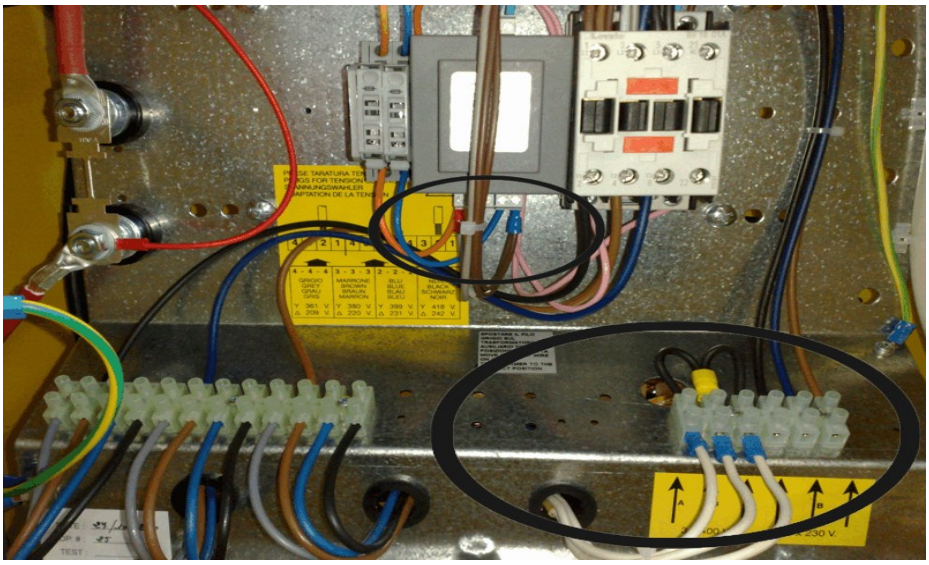
Before to install the charger:
Check that the charger input voltage (V) is identical to your AC power supply voltage.
Check that the charger max input power (KVA) is available from your AC power supply.

AC VOLTAGE SELECTION 3 x 220/380 V

The BOARD FOR INPUT VOLTAGE SELECTION is composed by six terminal blocks, to be connected in one of the two configurations represented on the picture inside the charger.

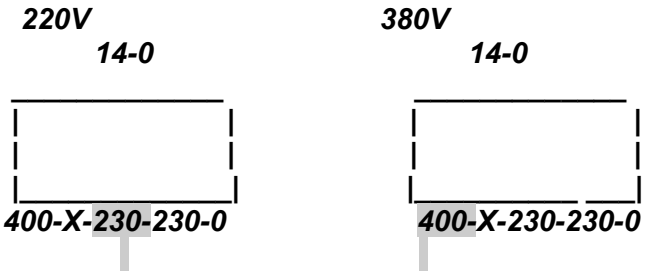
PROCEDURE:

- **Check that the charger is disconnected from AC input and battery;**
- **Open the cabinet and move the three wires (WHITE) in position 220V or 380V;**
- **Close the cabinet.**



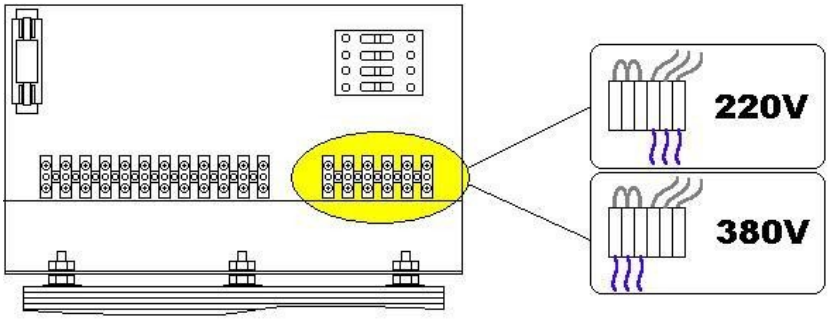
STEP:1 INTERNAL AUX TRASFORMER in the middle of the picture

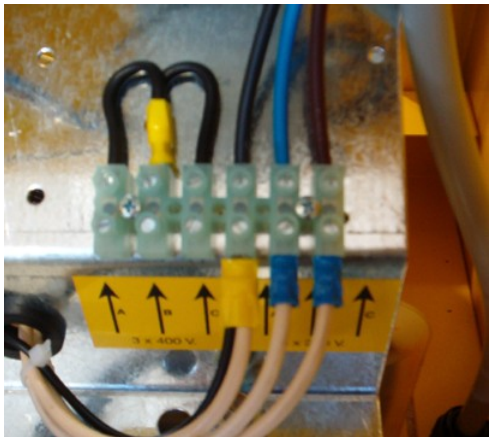
a)



- GRAY WIRE

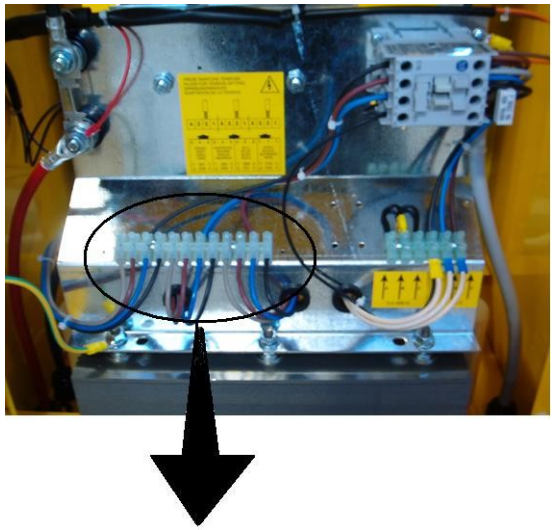
STEP:2

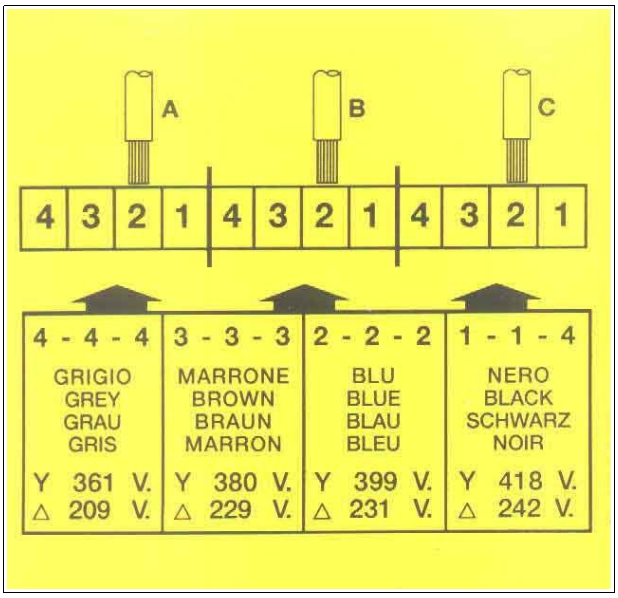




AC INPUT VOLTAGE ADJUSTMENT

The local AC input voltage must be measured with an adequate voltmeter, then the charger input must be adjusted by moving the three wires marked with the letters A, B, C on the PLUGS FOR INPUT VOLTAGE ADJUSTMENT.





PROCEDURE:

- **Check that the charger is disconnected from AC input and battery;**
- **Open the cabinet and move the wires A, B, C to the desired position.**
- **Close the cabinet.**

GROUNDING AND LINE CONNECTION

WARNING !

The cabinet of the battery charger must be properly grounded to protect personnel against hazard of electrical shock in case of fault on the charger! The grounding conductor must have a current carrying capacity equal or higher than the current carrying capacity of the AC-input wires.

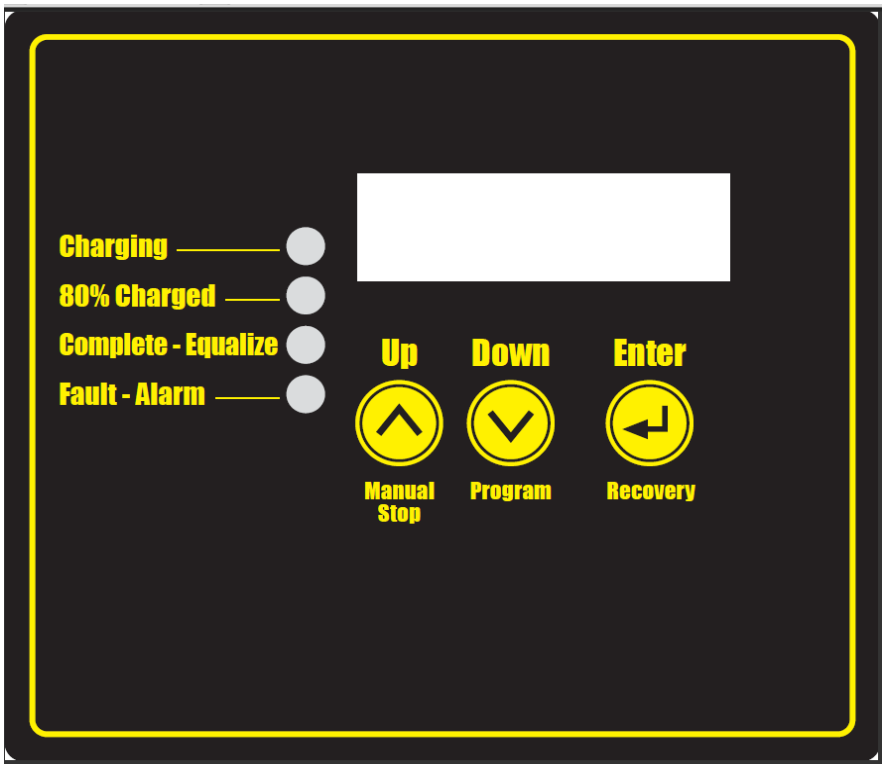
CAUTION !

Allow adequate air circulation to prevent internal heat buildup.
Do not place the unit near materials that may block the ventilation slots.
Do not install the unit near heat sources such as radiators or air ducts, or in a place subject to direct sunlight, excessive dust, mechanical vibration or shock.

If the charger is to be connected to the AC power supply with a flexible jacketed cable, one having a separate grounding conductor should be used.

If, for any reason, an input cable which does not include a grounding conductor is used, the equipment must be grounded with separate conductor. Minimum size and color coding requirements must be in accordance with any applicable national or local code.

4. HOW TO USE THE CHARGER



PRELIMINARY CONTROLS

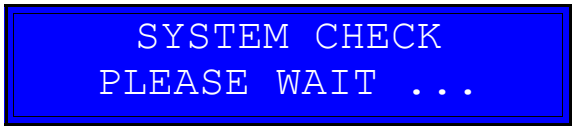
- Inspect the charger completey for loose screws, electrical connections or other damages;
- Check that all the ventilation slots are not obstructed to assure proper air flow;
- Make sure that the charger is installed as instructed in this manual and in accordance with any applicable national or local Code.

PROGRAMMING MODE

Turn on the charger by moving the main switch to position “1”.

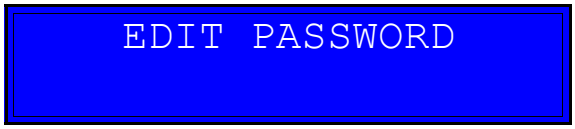
The charger will perform an automatic test of the control circuits, and will wait for a random delay on start.

The display will visualize the following messages.



HOW TO ACTIVATE USER PROGRAMMING MODE

- Press the button DOWN and keep it pressed for 3 seconds
  The display will show the message:



- Enter the Programming Password. UP_DW_UP_DW_UP
  The display will show the message:

HOW TO MODIFY A VALUE

- Scroll between the programmable values using the UP/DOWN buttons.
- In order to modify a value, press ENTER and keep it pressed for 2 seconds, until the cursor will start blinking over the value that can be modified.
- Modify the value using the UP/DOWN buttons.
- Confirm the modified value by pressing ENTER for 2 seconds, until the cursor will disappear. At this point the new value will be saved.

HOW TO RETURN TO NORMAL MODE

- Press the buttons UP and DOWN simultaneously.

PARAMETER 1: NOMINAL OUTPUT VOLTAGE

Programmable values: 12-24-36-48-72-80-96-120 Volts

Default value: Nominal voltage of the charger

NOTES:
This parameter should be changed only after replacing the control board of the charger.

PARAMETER 2: NOMINAL CHARGING CURRENT

Programmable values: From 10 to 500 Amps

Default value: Nominal output current of the charger

NOTES:
This parameter should be changed only after replacing the control board of the charger.

PARAMETER 3: GASSING VOLTAGE

Programmable values: from 2.35 to 2.50 V/Cell

Default value: 2.40 V/cell

NOTES:
This charging algorithm of the AR-TOP charger is adaptive, so it's capable of adjusting the charging curve even if the gassing voltage of the battery deviates significantly from the programmed value.
For this reason, this parameter should be modified only when using non-standard batteries, or if the operating temperature is extremely low or high.

PARAMETER 4: MAXIMUM VOLTAGE

Programmable values: from 2.40 to 2.80 V/Cell, or DISABLED

Default value: 2.80 V/cell

NOTES:
This parameter sets a maximum limit for the cell voltage. If this limit is reached, the charge is terminated and a specific warning message is given.

PARAMETER 5: CHARGING CURVE

Programmable values:

A)	WSa - Automatic Algorithm	[7-8 hours]	[I=22-26% of C]
B)	Wa – Finishing Charge 2 Hours	[10-12 hours]	[I=15-26% of C]
C)	Wa – Finishing Charge 3 Hours	[10-12 hours]	[I=15-26% of C]
D)	Wa – Finishing Charge 4 Hours	[10-12 hours]	[I=15-26% of C]
E)	Wa – Finishing Charge 5 Hours	[10-12 hours]	[I=15-26% of C]
F)	Wa – Finishing Charge 6 Hours	[10-12 hours]	[I=15-26% of C]
G)	Wa – Finishing Charge Proportional 25%	[10-12 hours]	[I=15-26% of C]
H)	Wa – Finishing Charge Proportional 33%	[10-12 hours]	[I=15-26% of C]
I)	Wa – Finishing Charge Proportional 50%	[10-12 hours]	[I=15-26% of C]
J)	Wa – Finishing Charge Proportional 66%	[10-12 hours]	[I=15-26% of C]
K)	Wa – Finishing Charge Proportional 75%	[10-12 hours]	[I=15-26% of C]

Default value: Usually specified at the order.
If not specified, default value is D).

NOTES:
This parameter allows to adjust the finishing rate of the charger, depending on the matching Current VS Capacity that has been chosen at the order. The proper setting of this parameter is useful to maximize the electrical efficiency of the system, and to minimize the temperature rise of the battery during the finishing charge.

EXAMPLE 1)
If the battery capacity is 600 Ah and the time available for charging it is 10-12 hours, the recommended AR-TOP charger should have a nominal current of 100A (~16% of C), and the default curve D (Wa Finishing charge 4 hours) will be correct.

EXAMPLE 2)
If the battery capacity is 420 Ah and the time available for charging it is 7-8 hours, the recommended AR-TOP charger should have a nominal current of 100A (~25% of C), and it should be programmed to operate with charge charging curve A (WSa – Automatic Algorithm).

EXAMPLE 3)
If the battery capacity is 720 Ah and the time available for charging it is 7-8 hours, the recommended AR-TOP charger should have a nominal current of 120A (~16% of C), and the default curve D (Wa Finishing charge 4 hours) will be correct.

PARAMETER 6: EQUALIZE INTENSITY

Programmable values: from 1 to 8 hours

Default value: 2 hours

NOTES:
This parameter allows to adjust the duration of the weekly Equalize cycle. In most of the cases the default value of 2 hours works well, but sometimes it can be useful to modify this setting, depending on the status of the battery and on the operating cycle.

IMPORTANT:
The battery will be equalized only during the programmed time window (See parameters 10 and 11). If the Equalize time window is not set, or it's set too short, the battery will not receive a sufficient Equalize.

PARAMETER 7: DATE and TIME

Programmable values: Day/Month/Year, Hour/Minute
Default value: Chargers with European Specs are set by default at GMT+1
Chargers with North American Specs are set by default at GMT-5

NOTES:
It's fundamental to keep the Real Time Clock set to the correct date and time, in order to use all the time base functions.
It's necessary to adjust the Clock manually in Daylight saving time periods.
The Charger calculates the Day of the Week automatically.

PARAMETER 8: START TIME WINDOW

Programmable values: From 00.00 to 23:59
Default value: From 00.00 to 23:59

NOTES:
This parameter sets a time window during the day in which the charger is allowed to start a new charge cycle. If a battery is connected outside of this time window, the charger will remain in stand-by mode until the programmed Start time will be reached.
Once the charge cycle has begun, this time window is not considered anymore.

PARAMETER 9: FULL CHARGE / OVERCHARGE TIME WINDOW

Programmable values: From 00.00 to 23:59
Default value: From 00.00 to 23:59

NOTES:
This parameter sets a time window during the day in which the charger is allowed to fully charge the battery.

Usually, this parameter is used in opportunity charging applications, with the purpose of avoiding useless gassing of the battery during the opportunity charging cycles, and to program a full charge of the battery during the night.

PARAMETER 10 and 11: EQUALIZE TIME WINDOW

Programmable values: Any day, from 00.00 to 23:59
Default value: From SATURDAY at 12.00 to SUNDAY at 22.00

NOTES:
These parameters set a time window during the week in which the charger is allowed to fully charge and Equalize the battery.
It's recommended to set a minimum Equalize time of 12 hours after the normal completion of the charge cycle.

PARAMETER 12: WBM ENABLE

Programmable values: Enabled, Disabled, Optional
Default value: Disabled

NOTES:
This parameter sets the operation of the charger with the Wireless Battery Identification module WBM (optional). Three different operating modes are selectable.

Enabled: When a battery is connected, the charger establishes a communication with the WBM and uses the information stored into the WBM to optimize the charge cycle.
Only batteries with WBM installed and properly configured will be charged!

Disabled: The communication of the charger with WBMs is disabled, and any battery (with correct voltage) will be charged.

Optional: When a battery is connected, the charger tries to establish a communication with the WBM. If a WBM is found, it's used to optimize the charge cycle and to add the battery ID tag on the charge history log. If a WBM is not found, the battery will be charged anyway.

PARAMETER 13:WIRED IP ADDRESS RS-485/RESET/TEST WIRELESS

Programmable values: 1 to 254 (Hexadecimal)
Default value: 1

NOTES:
This parameter sets the IP address of the charger, when it's connected to a wired **www.DoctorFleet.com** management network.

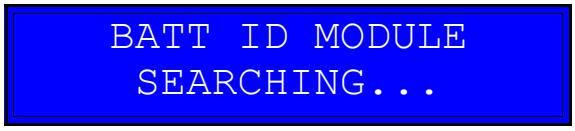
5. OPERATION

CONNECTION OF THE BATTERY, AUTOMATIC START

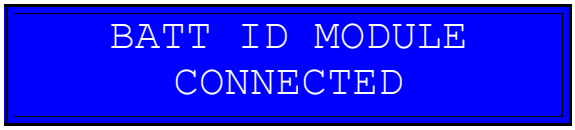
Connect the Battery to the charger, using a connector of adequate size.
When the battery is correctly connected, the charger visualizes the following message:

WIRELESS CONNECTION TO BATTERY IDENTIFICATION MODULE (OPTIONAL)

If the Battery Identification Module is enabled, a few seconds after the connection of the battery, the charger will try to establish a wireless connection. And the display will visualize the message:



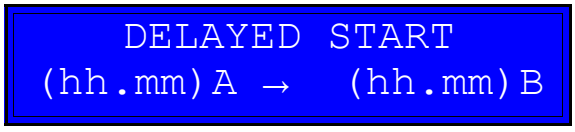
When the wireless connection is active the charger is ready to start the charging cycle. The display visualizes the message:



At this point, the battery information are transferred to the charger and are visualized on the display.

The charger is now ready to start.

Depending on the programmed start time window (Parameter 8), the charger may enter in stand-by mode, and the display visualizes the message:



Where (hh.mm)A represents the real time at that moment, and (hh.mm)B represents the programmed start time.

When the charge begins, the display visualizes the message:

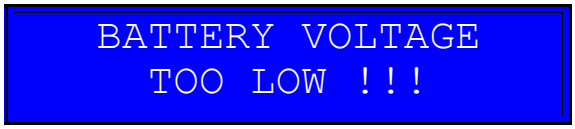
BATTERY VOLTAGE TOO HIGH

If the battery voltage is higher than a maximum threshold, the charge will not start and the display visualizes the message:

If this message appears, it's recommended to verify that the nominal battery voltage matches the nominal voltage of the charger. Probably a wrong battery has been connected.

BATTERY VOLTAGE TOO LOW

If the battery voltage is lower than a minimum threshold, the charge will not start and the display visualizes the message:



If this message appears, it's recommended to verify that the nominal battery voltage matches the nominal voltage of the charger.
Probably a wrong battery has been connected.

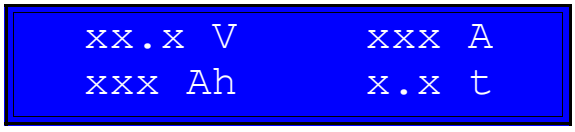
It's also possible that the battery has been deeply discharged, bringing the voltage below the minimum value required for the automatic start the charge.

In this case, it's possible to override the warning message and to start the charge manually, by pushing the button DOWN for 5 seconds. The AR-TOP will activate an automatic DESULPHATION-RECOVERY cycle, after that a standard charging cycle will begin.

CHARGE CYCLE

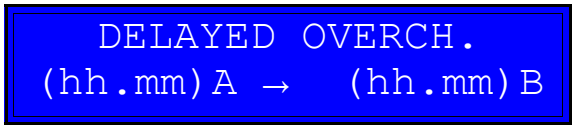
When the preliminary controls are complete, the charge starts automatically, and the display visualizes the following information:

- Battery Voltage [Volt]
- Charging Current [Amps]
- Time of Charge [hours.minutes]
- Capacity Returned [Ah]



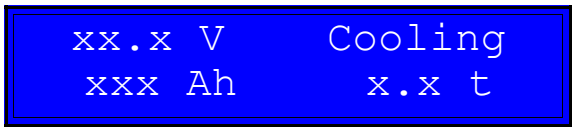
The AR-TOP Charger performs an exclusive charge cycle that is composed by stages at constant current and stages at pulsed current, with cool down pauses in between.
The management of the charging curve is totally automatic.

Depending on the programming of the Full Charge time window (Parameter 9), when the battery approaches the gassing voltage the charger may suspend the charge (typical opportunity charge cycle). In this situation, the display visualizes the message:



Where (hh.mm)A represents the real time at that moment, and (hh.mm)B represents the beginning of the Full Charge / Overcharge time window.

If the charging curve WSa is selected, the charger will alternate charging pulses and cool-down pauses during the finishing charge. During the pauses, the display visualizes the message “Cooling”.



EMERGENCY STOP

If the battery doesn't reach the gassing voltage within a predetermined time, the charger will suspend the charge, and it will visualize the message

In this case, the charge cannot proceed, and it's necessary to disconnect the battery.
It's recommended to control the battery for damaged cells.

AC INPUT BLACK OUT

If there is a black-out of the AC input, while the charge is in progress, the charger will shut down, while the charge parameters will remain in memory.

When the AC input will be recovered, the charger will restart the charge cycle automatically, and the display will show the message:

OVERCURRENT PROTECTION

If the AC input voltage is abnormally high and/or the AC input adjustments have not been done correctly (See Chapter "INSTALLATION"), the charging current may reach an excessive value.

In this case, the charger will suspend the charge, and the display will visualize the message:

The charge will not proceed, and it's necessary to disconnect the battery.
It's recommended to control the AC input connections of the charger, as explained in Chapter 3 "INSTALLATION".
It's recommended to verify the condition of the battery, as it may have one or more cells in short circuit.

CHARGE COMPLETE

The charger shuts down automatically when the charge is correctly complete, and it will visualize the message:

At this time it's possible to disconnect the battery.

EQUALIZE CYCLE – AUTOMATIC (clock mode)

At the end of the charge, if the battery is left connected to the charger for a sufficient time, the charger activates the Equalize cycle automatically, based upon the programmed schedule.

If the charge cycle ends outside of the programmed Equalize time window, the charger remains in stand-by mode, and the display shows the message:

Where DAY and TIME represent the beginning of the programmed Equalize time window.

EQUALIZE CYCLE – MANUAL

During the charging of the battery the operator can scroll the menu of the display, and he can force a EQ manual cycle at the end of this cycle.

DESULFATION

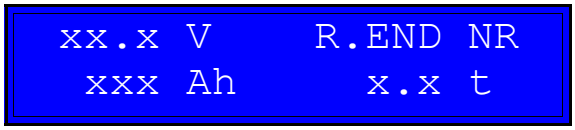
The operator can every time interrupt the standard charging and enable with a easy procedure a special desulfation cycle. During the charging the operator can press Enter few seconds and the display shows a desulfation menu, in this menu the operator can select the time during of desulfation and the type of restart of desulfation, infact sometimes it is strategic important to complete a standard charging after a completed desulfation cycle. With AR TOP special desulfation function this is very easy.

REFRESH-MAINTENANCE

This function is useful to keep the battery in perfect condition when it's not used for an long period (weeks, months, ...).

It is sufficient to leave the battery connected to the charger. After a normal termination of the charge and the equalize cycle, the control board will activate the charger automatically for 15 minutes of refresh charge every day.

While the charger waits before to activate a Refresh cycle, the display shows the messages:



- Battery Voltage [Volt]
- Nr of Refresh cycles already given to the battery
- Total Time of Charge [hours.minutes]
- Total Capacity Returned [Ah]

During cycle Refresh, the display shows the same set of information that are visualized during the normal charge cycle.

DISCONNECTION OF THE BATTERY DURING THE CHARGE

WARNING !

DON'T disconnect the battery from the charger while it is being charged.
ARCING AND BURNING OF CONNECTORS OR BATTERY EXPLOSION MAY RESULT!

If it's necessary to disconnect the battery while it's being charged, press the button UP for five seconds, in order to stop the charger manually.

The charger will suspend the charge and the display will show the message:

At this time it's possible to disconnect the battery.

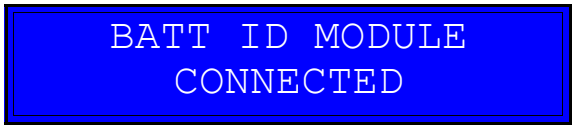
Eventually, the charge can be restarted, by pressing the button UP for 5 seconds.

6. PROGRAMMING BATTERY ID MODULES

When a battery ID module is installed on a battery for the first time, it must be initialized and programmed, by following this procedure.

Connect the battery to a AR-TOP charger (the Battery Recognition mode must be set to BATTERY ID MODULE or OPTIONAL).

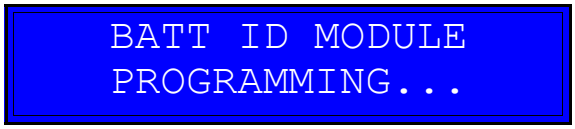
The AR-TOP charger will establish a communication with the New Battery ID module, and it will show the message:



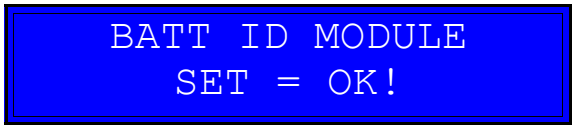
At this point, using the UP/DOWN buttons, it's possible to edit the battery ID information:

- ID Number (8 alphanumeric digits, to be confirmed individually by pressing ENTER for 3 seconds)
- Nominal Voltage
- Capacity
- Type

Once all the parameters are set correctly, push the buttons **UP+DOWN Simultaneously** in order to save the data to the ID module.
The programming sequence may take up to 3 minutes, while the charger display will show the message:



When the programming sequence is completed, the display will show the message:



At this point, it's possible to disconnect the battery from the charger.

If the battery is left connected, a charge cycle will be initiated.

The Battery ID Module will keep the information in memory for an unlimited time.
In order to erase the memory, it's necessary to disconnect the ID module from the battery.

PROGRAMMING HARDWARE RULES

During installation and programming activity it is necessary to ensure that the position of the battery power cables and charger cables are correct. As illustrated below, it is important that the cables are not overlapping or entwined in the cables of another battery.

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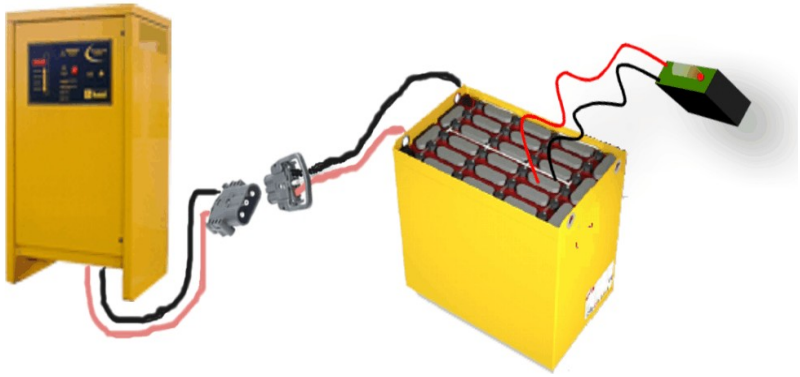


fig.1 correct position of the cables.

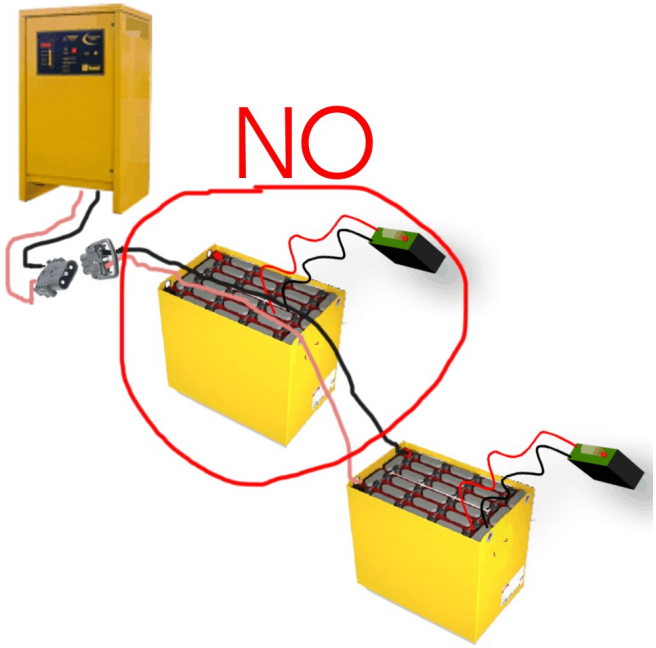


fig.2 incorrect position of the cables.

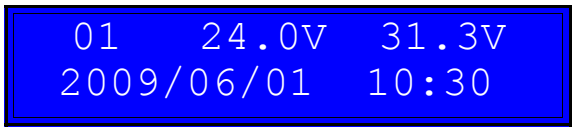
Failure to comply with these instructions may disturb the communication signals from the battery module, if this occurs the charger will generate the following alarm:

7. HISTORY LOG

The internal memory of the AR-TOP charger contains a log of the last >250 charge cycles.

The most significative parameters can be visualized on the display of the charger, while the complete history log can be accessed and downloaded through DoctorFleet.com management system.

The history log can be accessed at any moment, even while a charge cycle is in progress. It's sufficient to scroll the menu using the UP-DOWN buttons, until the display will visualize the first page of the most recent history log, that will have a format of this type:



At this point, press ENTER for 3 seconds, until the cursor will start blinking over the number 01 on the top left of the display.

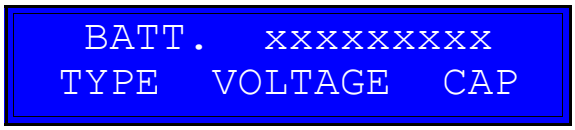
The results of each charge cycle are represented on two or three pages.
Use the UP-DOWN buttons to scroll between each record.

PAGE A
(ALWAYS VISUALIZED)

Where:

No =	Number of cycle (1 is the most recent)
Vstart =	Battery Voltage at the connection
Vstop =	Battery Voltage at the end of the charge
Start Date and Time =	Date and Time of the BEGINNING of the charge

PAGE B
(Not visualized if the battery recognition is set to VOLTAGE DRIVEN mode)



Where:

XXXXXXX =	Identification number of the battery ("ZZZZZZZ" if ID module was not found)
TYPE =	Battery Type
VOLTAGE=	Battery Nominal Voltage
CAP=	Battery Capacity

PAGE C
(Always visualized)

Where:

End Date and Time =	Date and Time of the TERMINATION of the charge
TT =	Charge Termination Code (see next paragraph)
HH.MM=	Total charge time
AHRET=	Total capacity Returned to the battery

8. CHARGE TERMINATION CODES

GROUP 1: CHARGE COMPLETED

00
Battery modules recognized. Start charging.

01
Charge completed successfully.

02
Charge completed successfully.
Equalize NOT executed because battery was disconnected.

03
Charge completed successfully.
Equalize started but not completed, because battery was disconnected during the cool-down time before the Equalize cycle.

04
Charge completed successfully.
Equalize started but not completed, because battery was disconnected while the Equalize was in progress.

05
Charge completed successfully. Over range maximum time during pulsed

06
Desulphation cycle completed successfully.

07
Charge completed successfully.
Equalize completed successfully.
Refresh-Cycle NOT executed because battery was disconnected.

08
Charge completed successfully.
Equalize completed successfully.
Refresh-Cycle started but not completed, because battery was disconnected while the Refresh was in progress.

09
Charge completed successfully.
Equalize completed successfully.
Refresh-Cycle completed successfully.

10
Gassing voltage reached successfully.
Full charge NOT executed because time window Disabled.

12
Charge completed successfully.
Equalize completed successfully.

GROUP 2: MANUAL STOP

11
Charge stopped manually, during a generic cooling state

20
Charge stopped manually, before to reach the gassing voltage.

21
Charge stopped manually, during the finishing charge.

22
Charge stopped manually, during eq.

23
Charge stopped manually, during refresh.

24
Charge stopped manually, during desulphation.

GROUP 3: BATTERY DISCONNECTED

30
The battery has been disconnected before the begin of the charge, while the charger was waiting for the programmed Start Time window.

31
The battery has been disconnected during the first part of the charge, before to reach the gassing voltage.

32
Successful Opportunity charging cycle.
The battery reached the gassing point, the charger entered in stand-by mode waiting for the Full Charge/Overcharge time window, and at that point the battery has been disconnected.

33
The battery has been disconnected during the finishing charge, while it was cooling between two charging pulses.

34
The battery has been disconnected during the finishing charge, while it was receiving a charging pulse.

36
Charge never started.
The battery has been disconnected while the charger was trying to establish a wireless connection with the Battery Identification Module (WBM).

37
Charge never started.
The battery has been disconnected while the charger was communicating with the Battery Identification Module (WBM).

38
Desulphation cycle NOT completed.
The battery has been immediately disconnected, at the beginning of the Desulphation cycle

39
Desulphation cycle NOT completed.
The battery has been immediately disconnected, before to complete the programming of the Desulphation cycle.

40
Desulphation cycle NOT completed.
The battery has been disconnected while the Desulphation cycle was in progress.

GROUP 4: EMERGENCY STOP

60
Emergency Stop!
Maximum voltage limit exceeded during first part of the charge, before to reach the gassing voltage.

61
Emergency Stop!
Maximum voltage exceeded during the finishing charge.

62
Emergency Stop!
Maximum voltage exceeded during the equalize cycle.

63
Emergency Stop!
Gassing voltage not reached within the predetermined time limit.

64
Charge never started.
Battery voltage was too LOW

65
Charge never started.
Battery voltage was too HIGH

66
Emergency Stop!
Maximum Current Limit Exceeded.

67
Emergency Stop!
Maximum voltage exceeded during the refresh cycle.

68
Emergency Stop!
Maximum temperature exceeded before to reach the gassing voltage.

69
Emergency Stop!
Maximum temperature exceeded during the finishing charge.

70
Emergency Stop!
Maximum temperature exceeded during the equalize cycle.

71
Emergency Stop!
Maximum temperature exceeded during the refresh cycle.

72
Emergency Stop!
When a battery is connected, the WBM communicate that the voltage of battery is not compatible with this charger

76
Emergency Stop!
Maximum temperature exceeded during desulphation.

GROUP 5: WARNING MESSAGES

80
Maximum finishing charge time (safety timer) exceeded.
Charge termination criteria (dV/dt) not reached.

82
The battery has been disconnected while the charge was in progress, in a generic state.

83
Output fuse blown.

85
Communication problem with Wireless Battery Module.

99
Black out of the AC input.

- END OF MANUAL -